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NEW WORK ON SEISMOLOGY IN THE USSR

In the Geophysics Institute of the Academy of Sciences USSR, Ye. F. Savarenskiy, Director of the "Moskva" Central Seismic Station, has finished studying the angles of emergence of seismic waves and related problems of great theoretical and practical interest.

Observational seismology is primarily concerned with hodographs which can determine the angles of emergence by differentiation, but since the hodograph is an empirical curve, this produces inaccurate results.

A more reliable, although less developed, method of studying velocities within the earth is based upon direct determination of the angles of emergence. Academician B. B. Golitsyn is credited with the first, and only, basic work on angles of emergence. He emphasized the need for developing accurate methods of determining angles of emergence directly from measurements of seismic oscillations. However, because of difficulties, the principal one being calculation of the influence of stratification in the earth's crust, these methods were given little attention until recently.

Savarenskiy's study may be divided into several parts. First, he studied how the earth's surface and the internal boundaries of the earth's crust influence the angle of emergence of seismic waves. Next, he solved elasticity problems of how the free boundary of an elastic half-space, and the plane surface of separation between two half-spaces influence the angle of emergence of a plane wave by assuming an arbitrary law for the variation in displacement with time. Savarenskiy worked out correction tables for calculating how much the earth's crust and surface and thin layers of sedimentary rock influence the angles of emergence. Actual calculations made on the geological structure of the region around Pulkovo Observatory showed that the influence of thin layers is much less than might be expected from the geometrical refraction diagram.

Furthermore, the author discussed methods of studying the apparent angles of emergence of seismic waves. The proposed method of instrumental observations determines the angle of emergence by directly calculating the ratios of

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the different displacement components, instead of by measuring the absolute magnitude of the actual ground displacement. This greatly simplifies the actual observations. Errors caused by unbalance of seismic equipment were considered, and methods of eliminating them were pointed out. Reorganization of the "Moskva" Central Seismic Station to incorporate the observational method proposed has completely justified itself, as shown by the extensive experimental data cited in the work.

Savarenskiy also proposed a new "differential" method of measuring the angle of emergence with respect to the difference between travel times of seismic waves at two close stations. This method was tested by observations at the "Moskva" and "Pulkvo" stations.

In conclusion, the author listed results of applying his method to old and new observational data. The data collected by Golitsyn for 1914 - 1915 was used along with the latest seismograms of the "Moskva" station. Interpretation of the observational data permits one to construct curves of velocity versus depth, and to obtain new data on the speed of propagation of transverse waves at various depths in the region of the Russian platform. The velocities found averaged 10 percent less than those found by differentiating hodographs.

Measurements of the angles of emergence also were used with success to determine accurately the coordinates of centra and to study the local structure of the earth's crust. Measurements of the angles of emergence at Middle Asiatic stations, for example, revealed a zone of broad unconformed dislocations in the foothills of the Pamirs.

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